

## Licensable Technologies

# Brockwell Structures

### Applications:

- Crumbling zone structures to prevent catastrophic failures
- Lightweight building frame for aerospace applications, such as UAV's, satellites and other smaller aircrafts
- Lightweight blade structures on wind turbines for increased efficiency

### Benefits:

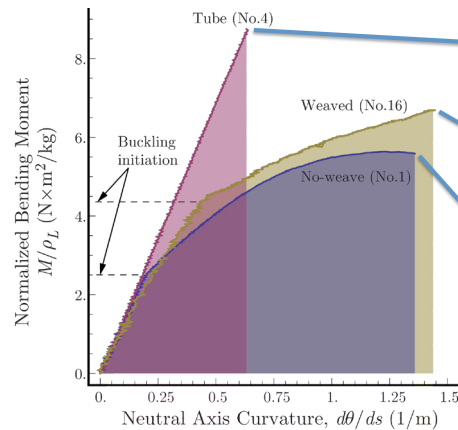
- Increased safety with structural energy absorption
- Engineered breakdown to increase impact and blast absorption
- Reduced structural mass to reduce the energy need for transportation

### Contact:

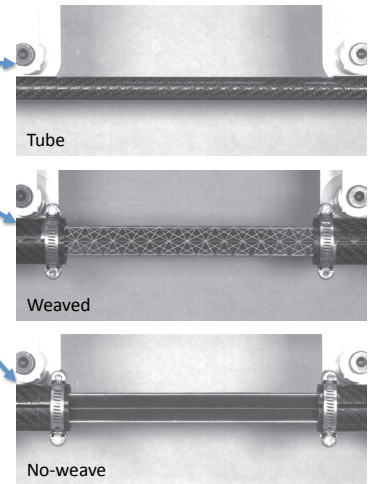
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Shaded area represents energy absorption per unit length of the beam sample



**Energy absorption comparison between a commercial tube structure and Brockwell structures (weaved and no-weave).**

### Summary:

The joints of carbon tubes and rods tend to be weak due to the use of mechanical fixtures and glues. When materials break, they tend to do so in a violent manner, which causes separation and total failure of these parts.

Los Alamos National Laboratory's Brockwell Structures are building materials made of both beams and fibers that are ultra-light and ultra-rigid. Brockwell Structures:

- Are lightweight
- Have better energy absorption than tube structures
- Normalized bending stiffness (rigidity) on par with tubes of similar mass
- Have higher buckling loads by restricting the buckle to occur at higher modes

Brockwell Structures have very strong joints due to a weave pattern of Kevlar that distributes stress throughout the structure, preventing stress from concentrating in one area. The innovative design and scalable manufacturing method of Brockwell Structures prevent total catastrophic failures in composite materials and increase the strength to weight ratio of structures.

The primary role of the Kevlar weave pattern is to distribute forces through the structure and hold the graphite skeleton in place. This prevents bowing and keeps the structure in rigid stage. The secondary role of the Kevlar weave pattern is to sinch down on the graphite once the structure has been compensated and is in the process of being pulled apart. Sinching has a dampening effect that increases resistance as it is pulled. Finally, the third role of the Kevlar weave pattern is to keep the broken structure tethered together and prevent a catastrophic failure and separation.

The invention is applicable to a wide range of structural components, beam sizes, beam materials and fibers.

**Status:** LANL is seeking partnership opportunities to commercialize Brockwell Structures.

[www.lanl.gov/partnerships/license/technologies/](http://www.lanl.gov/partnerships/license/technologies/)

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